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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/002,684 | 10/24/2001 | D. Gregory More | 102175-200 | 4640 |

34704 7590 07/09/2003
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SUITE 1201
NEW HAVEN, CT 06510

[REDACTED] EXAMINER

BANNAPRADIST, LISA M

[REDACTED] ART UNIT [REDACTED] PAPER NUMBER

3676

DATE MAILED: 07/09/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|------------------------|---------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/002,684 | MORE ET AL. |
| | Examiner | Art Unit |
| | Lisa Bannapradist | 3676 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 28 April 2003.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-9 and 21-25 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-9, 21-25 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

| | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ . | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Response to Amendment

1. Applicant's arguments, see amendment, filed April 25, 2003, with respect to the rejection(s) of claim(s) 1-9 under US 6,227,546 to Halling and US 6,302,402 to Rynders et al. have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of US 5,249,814 to Halling and "Alloy Design for Nickel-Base Superalloys" to Harada et al.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. **Claims 1-7, 9, 22, 24, and 25** are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,249,814 to Halling in view of "Alloy Design for Nickel-Base Superalloys" to Harada et al. (hereafter referred to as Harada).

Halling discloses an annular seal having a central longitudinal axis and forming a seal between interior and exterior volumes (56, 62) when compressed between opposed first and second parallel faces (52, 58). The seal comprises metallic first (14) and second (12) layers where the second layer is integrated with the first layer (see col. 4, lines 14-17). The first layer is cold formable. The layers extend continuously between first and second portions (40a, 42a) where

only the second layer contacts the exterior volume. The seal has a radial section of bellows-like structure.

Halling fails to expressly disclose nickel-based superalloys within the layers. However, **Harada** teaches the use of nickel-based superalloys for use in gas turbines for the purpose of providing increased creep rupture strength, tensile property, and hot corrosion resistance. Thus, it would have been obvious to one having ordinary skill in the art at the time of applicant's invention to modify Halling's seal layers to consist a nickel-based superalloy for the purpose of providing increased creep rupture strength, tensile property, and hot corrosion resistance as taught by Harada.

Although Halling discloses that the first and second layers can be made of different materials in order to provide a sealing ring having specific mechanical properties on a specific layer as desired (see col. 4, lines 22-26), Halling fails to disclose the second layer as having a higher resistance to stress relaxation than the first layer, or that the second layer consists of a cast γ' hardened nickel-based superalloy. **Harada** discloses the use of a cast γ' hardened nickel-based superalloy (MAR-M247) within a gas turbine because of the cast γ' hardened material's superior "creep rupture strength, tensile properties, and hot corrosion resistance [in comparison] to that of commercial alloys". Thus, the cast γ' hardened superalloy as taught by Harada has a higher resistance to stress relaxation/creep than that of commercial nickel-based alloys. Furthermore, since Halling teaches that one layer can be made of a different material than the other layer, it would have been obvious to one having ordinary skill in the art at the time of applicant's

invention to create the second or outer layer to include a cast γ' hardened nickel-based superalloy for the purpose of the increasing the creep rupture strength, tensile property, and hot corrosion resistance of the second layer of the seal.

In response to claims 6 and 25: Halling discloses that the span and compressive strength of the seal depends on the thickness and number of plies within the seal (col. 4, line 59). Thus, since the combination of Halling and Harada discloses applicant's invention having similar material configuration, thickness, number of plies, and geometry, the resulting seal would also inherently satisfy the limitations of claims 6 and 25.

4. **Claims 8, 21, and 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Halling in view of Harada as applied to the claims above, and further in view of US 6,302,402 to Rynders et al.

The combination of Halling and Harada fails to disclose a target thermal operating condition within applicant's specified range. **Rynders** teaches an annular seal (Fig. 6G) which operates at a target thermal condition from 871°C -1093°C (col. 4, line 58) for the purpose of permitting the seal to operate through multiple thermal cycles (see abstract) without cracking for use in high-temperature applications. It would have been obvious to one having ordinary skill in the art at the time of applicant's invention to create an annular seal capable of withstanding higher temperatures in the range specified by applicant for the purpose of operating the seal through

multiple thermal cycles without cracking in an environment where the materials to be sealed have different coefficients of thermal expansion.

In response to claim 21, the creep resistance of the seal made with Harada's materials will be greater than the creep resistance of cold-formed seals of like dimensions during thermal operating conditions. The combination of Halling and Harada discloses applicant's invention except for the creep resistance as being greater specifically at 982°C, but it would have been obvious to one having ordinary skill in the art at the time of the invention to reach this temperature within a gas turbine as taught by Rynders et al. for the purposes stated above.

Response to Arguments

5. Applicant's arguments filed April 28, 2003 have been fully considered but are moot in view of the new grounds of rejection. Halling proves to disclose an integrated structure as recited in claim 1. Harada further discloses the particular relative stress relaxation resistance and cast-hardened nickel based superalloy also as claimed by applicant. The combination of Halling and Harada teaches a higher resistance to stress relaxation for the coating in comparison to the base layer. The compressive strength properties are also satisfied by the combination of Halling and Harada as cited above. Applicant's specification (page 4, line 27) provides support that Harada's material (MAR-M27) is a preferred cast γ' hardened nickel-based superalloy coating.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 3,575,432 to Taylor, US 3,797,836 To Halling, and "The Need for High Temperature Coatings in Industrial Gas Turbines" to Whitehurst et al.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lisa Bannapradist whose telephone number is 703-305-4806. The examiner can normally be reached on Mon-Thurs and every other Friday from 8:30 - 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on 703-308-3179. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9326 for regular communications and 703-872-9327 for After Final communications.

Art Unit: 3676

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-4177.



Anthony Knight
Supervisory Patent Examiner
Technology Center 3600

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June 27, 2003